



Designation: E1704 – 95 (Reapproved 2018)

Standard Guide for Specifying Acoustical Performance of Sound-Isolating Enclosures¹

This standard is issued under the fixed designation E1704; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 The guide covers the development of criteria for the acoustical performance of a broad variety of acoustical enclosures by identifying information necessary to unambiguously describe acoustical performance. This guide is not a standard ASTM specification for a sound-isolating enclosure.

1.2 Excluded from the scope of this guide are technical considerations for enclosure design that do not pertain directly to acoustical performance.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

C423 Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

C634 Terminology Relating to Building and Environmental Acoustics

E836 Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings

E413 Classification for Rating Sound Insulation

E596 Test Method for Laboratory Measurement of Noise Reduction of Sound-Isolating Enclosures

2.2 ANSI Standards:

ANSI S1.4 Specification for Sound Level Meters³

ANSI S3.1 Maximum Permissible Ambient Noise Levels for Audiometric Test Rooms³

ANSI S3.6 Specification for Audiometers³

ANSI S12.31–S12.35 Methods for Determining the Sound Power Levels of Machines and Equipment³

2.3 ISO Standard:

ISO 3741–3745 Acoustics—Methods for Determining the Sound Power Levels of Machines and Equipment⁴

2.4 Government Standard:

29 CFR 1910.95 Occupational Noise Exposure [Occupational Safety and Health Administration]⁵

2.5 Other Standard:

VDI 2711 Schallschutz durch Kapselung [Verein Deutscher Ingenieure, Beuth Verlag GmbH, Berlin] [German] [Noise Control by the Use of Enclosures]⁶

3. Terminology

3.1 Definitions:

3.1.1 Standard definitions of acoustical terms may be found in Terminology **C634**.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *A-weighted sound pressure level*—sound pressure level measurements made with the A-weighting filter applied as defined in ANSI S1.4, denoted L_{PA} in this guide.

3.2.2 *C-weighted sound pressure level*—sound pressure level measurements made with the C-weighting filter applied as defined in ANSI S1.4, denoted L_{PC} in this guide.

3.2.3 *enclosure*—a structure, usually free-standing, which substantially or completely encloses a given space or object. This does not include barrier walls, partitions within a building, or other partial structures.

¹ This guide is under the jurisdiction of ASTM Committee E33 on Building and Environmental Acoustics and is the direct responsibility of Subcommittee E33.03 on Sound Transmission.

Current edition approved Oct. 1, 2018. Published November 2018. Originally approved in 1995. Last previous edition approved in 2010 as E1704 – 95 (2010). DOI: 10.1520/E1704-95R18.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁴ Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, <http://www.iso.ch>.

⁵ Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

⁶ Available from Beuth Verlag GmbH, Burggrafenstrasse 4-7, 1000 Berlin 30.

3.2.4 *enclosure-generated noise*—sound created by the operation of the enclosure systems, such as lighting and ventilation.

3.2.5 *level reduction*—for the purposes of this guide, the arithmetic difference between sound pressure levels at a specific location before and after the installation of the enclosure, expressed in decibels.

3.2.6 *level reduction specification*—specification of the acoustical performance of an enclosure by stating the reduction in sound pressure level caused by the enclosure.

3.2.7 *personnel enclosure*—an enclosure designed to keep sound energy from personnel or equipment therein. Examples of personnel enclosures include but are not limited to audiometric booths, in-plant offices, broadcast booths, and acoustical test chambers.

3.2.8 *pre-installation sound pressure levels*—the sound pressure levels, as a function of frequency, that are present prior to the installation of the enclosure. In most cases this is determined by measuring the ambient sound pressure levels in the host area but in some cases, such as new construction, the sound pressure levels must be predicted.

3.2.9 *sound pressure level specification*—specification of the acoustical performance of an enclosure by stating the maximum sound pressure levels that shall exist after installation.

3.2.10 *source enclosure*—an enclosure designed to keep sound energy from personnel or equipment on the outside. Such applications include, but are not limited to, equipment silencing, secure communications, music practice, and acoustical testing.

4. Summary of Guide

4.1 An explanation of the determination and subsequent specification of acoustical performance of sound-isolating enclosures is presented.

4.2 Two types of specifications are described in this guide. The recommended method (sound pressure level specification) is to specify the maximum permissible sound pressure levels that may be present after installation of the enclosure. The alternate method (level reduction specification) is to specify the enclosure's level reduction.

4.3 The type of specification selected depends largely on the enclosure application and the data available. A sound pressure level specification usually applies to a specific site, while the level reduction specification may have broader application. Also, the sound pressure level specification is more appropriate where specific sound pressure levels are required, while the level reduction specification reflects a more general interest in amounts of noise level reduction.

4.4 Some guidance is provided in [Appendix X1](#) on selecting a specification type based on the enclosure application and the information available.

4.5 Substantial guidance is given on the essential acoustical data that must be compiled.

4.6 A non-mandatory model specification [Appendix X2](#) is included that embraces both specification types. It also serves as a guide for identifying and gathering information necessary to the manufacturer for designing the enclosure.

5. Significance and Use

5.1 This guide can be used to produce a specification for the acoustical performance of an enclosure.

5.2 This guide is intended for those familiar with basic concepts of acoustics.

5.3 Although this guide provides detailed guidance in matters relating to specification of acoustical enclosures, it is not a substitute for the experience and judgment of an acoustical or noise control professional.

5.3.1 This guide calls for measurements common within acoustical practice.

5.3.2 The more critical the performance requirements of the enclosure, the more the user should consider seeking the services of an acoustics or noise control professional.

5.4 The specifying of a sound-isolating enclosure has three sequential steps:

5.4.1 Determine the sound pressure levels that exist at specific locations prior to the introduction of the enclosure,

NOTE 1—In the case of new construction, the sound pressure level is often estimated from the sound power levels of noise-emitting equipment and a general description of the acoustical properties of the environment.

5.4.2 Determine the maximum permissible sound pressure levels that must exist at the same locations after the introduction of the enclosure, and

5.4.3 Determine the required enclosure level reduction. The required isolation is related to the difference between the sound pressure levels before and after the introduction of the enclosure.

5.5 Many specifications are for multiple enclosures or enclosures with multiple functions, or both. It is beyond the scope of this guide to provide detailed guidance for every possible combination. Separate specifications for each source-enclosure-receiver combination should be used in such a case.

5.6 The type of specification that should be selected depends both on the purpose of the enclosure and how crucial its performance is. In general:

5.6.1 If exceeding a particular maximum permissible sound pressure level spectrum would render the enclosure unsuccessful, a sound pressure level specification should be used.

5.6.1.1 This guide assigns all phases of acoustical design are delegated to the supplier. Compliance is usually more easily verified than with the level reduction method.

5.6.2 If the criteria for the success of the enclosure are less stringent or not related to a specific maximum permissible spectrum, a level reduction specification may be used.

6. Recommended Specifications

6.1 The sound pressure level specification specifies the maximum permissible sound pressure levels that may exist either inside or outside the enclosure after installation. Pre-installation sound pressure levels must also be presented.